# GEORGIA INSTITUTE OF TECHNOLOGY
## OFFICE OF CONTRACT ADMINISTRATION
## SPONSORED PROJECT INITIATION

Date: 1/28/80

Project Title: Multiple-Service Switching Systems

Project No: A-2559

Gr. Cd Co

Project Director: Mr. G. L. Peckham

Sponsor: Megaplex Networks, Inc.; Atlanta, GA

Agreement Period: From 1/21/80 Until 8/20/80

Type Agreement: Standard Industrial Agreement dated 1/21/80

Amount: $54,991

Reports Required: Monthly Progress Reports

Sponsor Contact Person (s):

Technical Matters

Mr. John Stewart
President
Megaplex Networks, Inc.
Atlanta, Ga
Home # (404) 256-5603

Contractual Matters
(thru OCA)

Defense Priority Rating: none

Assigned to: CSTL/SAD (School/Laboratory)

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GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 3/26/86

Project No. A-2559 ~~School~~/Lab ECSL

Includes Subproject No.(s) 

Project Director(s) W. A. Baird GTRC / ~~GIT~~

Sponsor Megaplex Networks, Inc.

Title Multiple-Service Switching Systems

Effective Completion Date: 8/20/80 (Performance) (Reports)

Grant/Contract Closeout Actions Remaining:

[XX] None

[ ] Final Invoice or Final Fiscal Report

[ ] Closing Documents

[ ] Final Report of Inventions

[ ] Govt. Property Inventory & Related Certificate

[ ] Classified Material Certificate

[ ] Other 

Continues Project No. Continued by Project No. 

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FORM OCA 69.285

# MULTI-SERVICE SWITCHING SYSTEM
# FOR MEGAPLEX NETWORKS, INC.

Monthly Status Report
February 1980

EES/GIT Project A-2559

Prepared by

Computer Science and Technology Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

W. A. Baird

for

Megaplex Networks, Inc.
5188 Roswell Road, N. E.
Atlanta, GA 30342

February

An overall MSSS system design was developed, and a copy of the design document is appended. The overall design for the Interdata 3220-resident code has been completed, and the detailed design is under way. The network data base is proving to be rather complex; therefore, the design effort is now concentrated on that effort. Software development using the 8/32 computer has begun, the primary structures of the data base and an initial coding for the switching task are in that Interdata files.

The protocol for communications between ELD-resident 1802 processors and the 3220 has been set down in preliminary form.

Detailed design for the code resident in the ELD96 1802 is nearly complete.

Purchase requests have been submitted for the 1802 Micro-Monitor and for the Intel microprocessor development system.

March

We will continue detailed program, communications protocol, and data base design and will be entering more FLECS code into the Interdata 8/32. Detailed design for the Interdata task which actually controls the ELDs, the switching subroutines which applications programs will use to access the switching capability, and the alarm polling task should be completed. Some of these FLECS programs will be partially complete. The design of the MSSS network database which is resident in the Interdata should be nearly complete.

The detailed design for ELD96-resident code should be completed in March. We will begin the design of the additional 1802 code for the ELD128. This ELD128-specific code comprises alarm polling and control-circuit switching.

Expenditures

As was agreed, a report of expenditures will be made in early March in a separate communication.

# MULTIPLE-SERVICE SWITCHING SYSTEM

Overall System Design

5 February 1980

This document presents the initial system design of the Multiple-Service Switching System. It shows the intent of the system designers with respect to the general methodology to be followed to solve the design problem as presented by the sponsor. This design is expected to serve as a detail designer's reference, but the detail design may depart from these principles as problem areas are discovered or as superior techniques are developed.

The purpose of the Multiple-Service Switching System (MSSS) is to develop the software for a communications line switching system accomplishing line concentration by using a minicomputer and ELD communication switches which contain programmable microprocessors. The programs of the microprocessors must be altered or re-written for this system. The minicomputer must be programmed to manage these communications switches or concentrators and supply communications line management to several applications residing in the minicomputer.

The system must support communications to intelligent terminal devices (not to be programmed in this effort). These terminal devices must be allowed to interrupt, signal, break, or otherwise indicate an unsolicited demand for service by the central minicomputer. Additionally, the terminal devices may be accessed or polled on a schedule or determination of the minicomputer. Telephone circuits which can demand attention by a ring signal must be supported - that is, their ring signals must be detected and the telephone circuit switched into a plant voice network under control of the minicomputer.

## Hardware Component Connections

We expect to make the initial connections of the concentrators, terminal devices, and the minicomputer as in figure 1. Some of the practices and protocols having to do with the layout and overall philosophy of the system can be set down at this time. They are discussed here in order from the outside world inwards towards the computer.

1. Management of unsolicited input from terminals.

We know of two types of unsolicited inputs; telephone ring signals and terminal microprocessor break signals. Telephone ring characteristics are defined, and ring-detect sensor cards will be installed in the ELD128s as needed, depending on which circuits are dedicated to telephone service. We expect to manage these by periodically (~0.25 second period) executing a program in each ELD128 microprocessor which interrogates the ring-detect sensor for each of the telephone circuits. The ELD128 microprocessor will then know of any ringing telephone circuits.

In the same execution period with the ring-detect poll, the ELD128 microprocessor must inspect each terminal microprocessor data circuit for a break signal by interrogating the loop-detect sensor attached to the circuit. Loop-detect cards are expected to be installed as required to permit sensing of each data circuit. We require that these data circuits be kept available for minicomputer-initiated outwards communications to the terminal microprocessor, and also that the terminal microprocessor be able to signal the ELD128 microprocessor. We expect to meet both these goals by allowing the terminal microprocessor to make its break signal by opening the circuit momentarily (that is, long enough to ensure detection in a loop-detect period). This will produce a (NOT loop-detect). The normal condition of the data circuit will be (loop-detect) sensed by the loop-detect card, because the terminal microprocessor's modem looks to it like a short circuit.

Loop-detect and ring-detect are indistinguishable to the ELD128 microprocessor. The sensor output signal will therefore be inverted on the loop-detect circuit boards. It will thus not be necessary to "teach" the ELD128 microprocessor which of its connections are telephone and which are data circuits. Inverting loop-detect sense will make the "alert" condition the same for data and voice, this is preferred for ease of programming.

2. ELD128 control circuit.

The control circuit for each ELD128 will be routed through the concentrator itself, as discussed in the next topic.

3. ELD128 far connections.

We expect to use the first far (128-connection side of the ELD128) connection for control signalling between the ELD128 microprocessor and the minicomputer. Going through the concentrator this way will allow us to change control paths in case of circuit failure. Of the remaining 127 possible connections, we expect that the data circuits be in contiguous connections, separate from the voice connections.

4. ELD128 near connections and ELD96 far connections.

There are enough ELD96 far connections to allow a twelve-ELD128 fanout from an ELD96, using eight connections for each ELD128. Of these eight possible connections the first will be reserved for ELD128 microprocessor control signalling (e. g. switching orders and concentrator polling). The second connection will be designated as the alternate control circuit, and it will be available for subscriber signals as long as the primary control circuit is functional. The rest of the connections may be employed without reservation.

5. ELD96 control circuit.

Because the ELD96s are close to the minicomputer, the control information for each ELD96 is passed through a direct connection to the minicomputer multiplexor. Each ELD96 thus "consumes" a multiplexor port for control signals.

6. ELD96 subscriber voice (near) connections.

Telephone subscribers will be connected to and disconnected from the plant voice network by the concentrators under minicomputer control. The telephone plant can use all ELD96 near connections which aren't used for switching control or for data.

7. ELD96 near data connections.

There are sixteen connections to the near side of each ELD96. In the initial switching-control method, one of these connections will be exclusively used for the control path for each ELD128 in the ELD96's fanout. There aren't enough connections available to do this and also handle subscriber data and voice in a fully-loaded ELD96, but this approach will easily serve three or four ELD96's (more than 400 terminal devices or voice circuits). Future solutions may include switching one multiplexor port to control more than one ELD96, or multi-point connections of several ELD128's, or other approaches.

In addition to the control circuits, one data circuit (initially, perhaps more later) will be employed for subscriber data, namely digital communications, by tasks in the minicomputer which are independent of the MSSS, except that they use MSSS to cause the data circuit to be switched to the proper terminal device.

The data circuits from the ELD96 are each connected to the minicomputer multiplexor through modems.

## Software Overview

The Multiple-Service Switching System central minicomputer software comprises three principal elements: a switch-control task, a switching orders queue, and a subroutine which applications programs can use to put switching orders into the queue and to request service by the switch-control task.

Each of the concentrators (ELD96 and ELD128) contains a program which receives and executes switching commands from the central minicomputer. The ELD128 program also periodically inspects ring- and loop-detect sensors to determine whether any alert conditions have arisen in its subscribers, maintains a list of alert respondents, replies to central minicomputer alter polling, and executes hardware-assisted circuit verification procedures.

An applications program which needs a circuit established uses the switching-order subroutine to construct a switching order. The switching order indicates the two terminals of the circuit, namely it identifies which far connection of which ELD128 is to be connected to which near connection of that ELD128's parent ELD96. Trunk (ELD96-to-ELD128) connections may not be specified by the applications program. The switching-order subroutine then places the switching order into the switching orders queue and messages the switch module of the switch control task. The subroutine suspends execution of the program which called it at this point, until the switch action has been successfully or unsuccessfully completed. A return-code set by the switch module will allow the applications program to take appropriate action if a failure occurs (e.g., re-try, wait and re-try, issue message,...)

The switch-control task is resident in the central minicomputer. Upon message receipt the switching module of the switch-control task will inspect the switching orders queue and attempt to execute any orders in it, in order of receipt in the queue. The module will audit the order to ensure that it makes sense in light of the system configuration, ensure that the connections requested are not busy, and then command the concentrators to make the connections needed to connect the specified terminals. The requesting program will be notified of the finished attempt and the status (done, or not-done and why).

The alert-polling module of the switch-control task periodically (~1 sec) communicates with each ELD128 in the system to see if it has sensed any loop-break signals or ring signals in <u>its</u> polling. Any positive responses are routed to a dispatcher module of the switch-control task for application-dependent action.

The switching and alert-polling modules of the switch-control task handle the control circuit fault recovery discipline of MSSS. If an ELD128 does not respond to signals from these modules then the modules will try to establish communications on the ELD128 control alternate paths. It has not yet been determined what module will attempt to home the ELD128's and the central minicomputer back onto the primary path, but this will be done periodially.

The various modules of the switching-control task cooperate in the maintenence of pointers and tables which keep track of the status of connections, circuits, and devices. Also, a disc file created by an interactive program is read when the switching-control task is initiated. This file shows the network layout and allows the MSSS net to be modified without reprogramming.

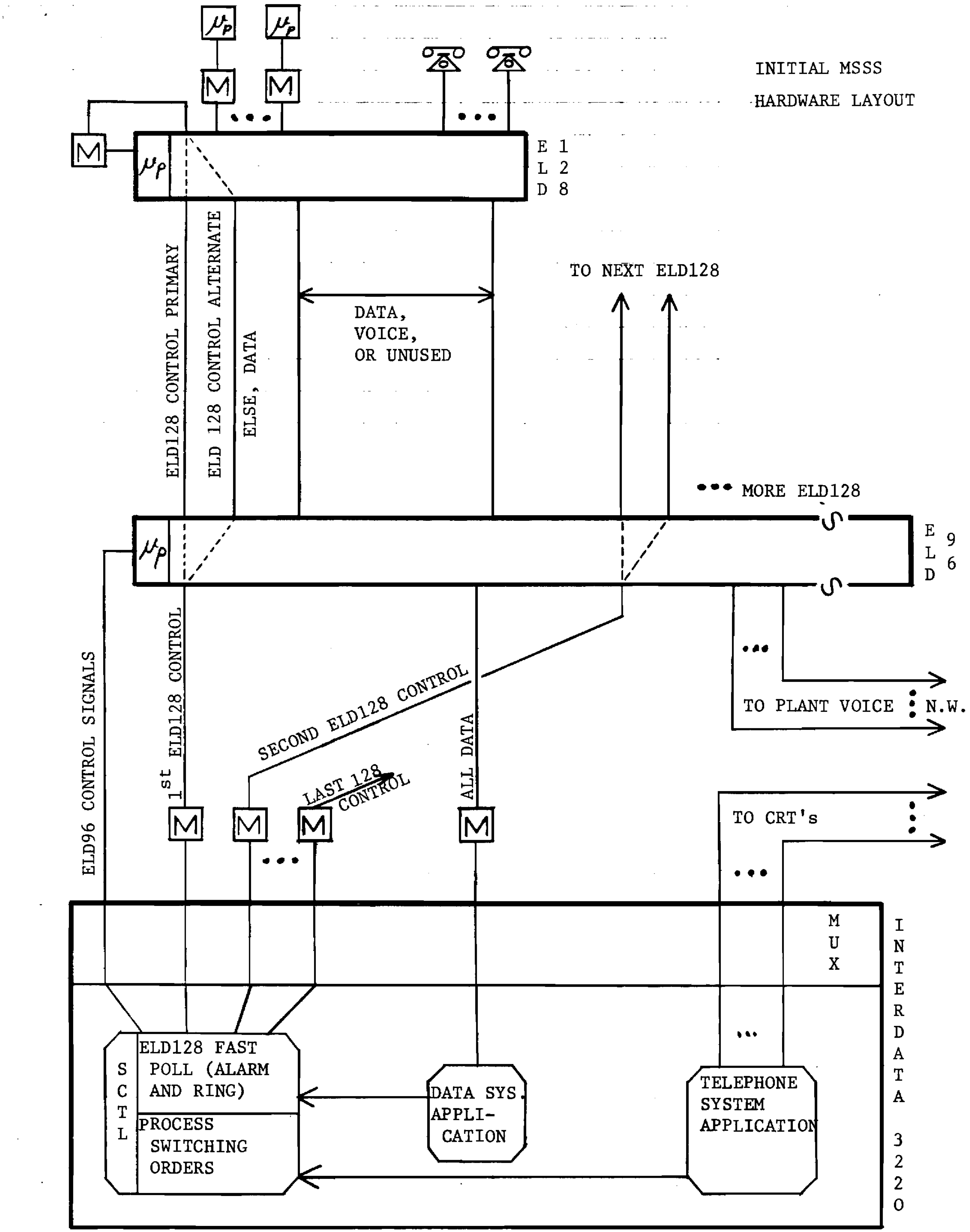
INITIAL MSSS
HARDWARE LAYOUT
ELD 128
ELD128 CONTROL PRIMARY
ELD 128 CONTROL ALTERNATE
ELSE, DATA
DATA, VOICE, OR UNUSED
TO NEXT ELD128
MORE ELD128
ELD 96
ELD96 CONTROL SIGNALS
1st ELD128 CONTROL
SECOND ELD128 CONTROL
LAST 128 CONTROL
ALL DATA
TO PLANT VOICE N.W.
TO CRT's
MUX
INTERDATA 3220
SCTL
ELD128 FAST POLL (ALARM AND RING)
PROCESS SWITCHING ORDERS
DATA SYS. APPLICATION
TELEPHONE SYSTEM APPLICATION

FIGURE 1

A-2559

# MULTI-SERVICE SWITCHING SYSTEM
# FOR MEGAPLEX NETWORKS, INC.

Monthly Status Report
March, 1980

EES/GIT Project A-2559

Prepared by

Computer Science and Technology Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

W. A. Baird

for

Megaplex Networks, Inc.
5188 Roswell Road, N. E.
Atlanta, GA 30342

MARCH

Significant changes were made in the MSSS design as a result of a Sponsor-EES meeting during which system design parameters were re-evaluated against the sponsor's current best estimates of future system loads and goals.

The control circuits of remote concentrators will no longer be switched through the network. This makes more remote-central connections available for subscriber voice and digital data and very significantly simplifies the control program logic in the Interdata and in the concentrator microprocessors. This change causes an decrease in system overall reliability which is acceptable to the sponsor, considering the present performance of telephone circuits.

The ELD96 concentrator will not be used in the MSSS network for central switching as was initially planned, because of its internal blocking problems. Instead, the ELD128 will be used throughout the network, multiple units connected in parallel as required to give the desired number of access connections.

An updated MSSS system design document is appended to this report, detailing the design changes.

The database is considerably less complex than before, with virtually no inversion or duplication. The system now has a "friendlier" design, and will not perform as much error-checking. This will allow greater flexibility and gives a more powerful system but will consequently allow a broader range of programming mistakes in applications programs utilizing MSSS services.

The switching and alert-polling tasks were re-written to meet the new design goals. Alert is complete except for Operating System timer and task-activation and MSSS error-logging. The switching task is about 80% done, lacking inter-task communications, error-logging, and I/O modules.

Work has continued on design and implementation of the software for the RCA microprocessors in the concentrators. Some re-working was done due to the system design changes and because of the discovery that ELD96 concentrators would not be used. The code already written for ELD96 was removed and the balance was modified for the ELD128. The programming for the ELD128 is now about 50% complete.

APRIL

Initial working versions of all Interdata and RCA programs should be completed during April and testing should begin using the 8/32.

EXPENDITURES

A report of March expenditures will be made in mid-April.

# MULTIPLE-SERVICE SWITCHING SYSTEM

## Overall System Design

25 March 1980

This document presents the system design of the Multiple-Service Switching System. It shows the intent of the system designers with respect to the general methodology to be followed to solve the design problem as presented by the sponsor. This design is expected to serve as a detail designer's reference, but the detail design may depart from these principles as problem areas are discovered or as superior techniques are developed.

The purpose of the Multiple-Service Switching System (MSSS) is to develop the software for a communications line switching system accomplishing line concentration by using a minicomputer and ELD communication switches which contain programmable microprocessors. The programs of the microprocessors must be altered or re-written for this system. The minicomputer must be programmed to manage these communications switches or concentrators and supply communications line management to several applications residing in the minicomputer.

The system must support communications to intelligent terminal devices (not to be programmed in this effort). These terminal devices must be allowed to interrupt, signal, break, or otherwise indicate an unsolicited demand for service by the central minicomputer. Additionally, the terminal devices may be accessed or polled on a schedule or determination of the minicomputer. Telephone circuits which can demand attention by a ring signal must be supported - that is, their ring signals must be detected and counted.

## Hardware Component Connections

MSSS will support up to 2048 remote terminals with 16 remote concentrators. Each remote concentrator will be connected to the central site concentrator(s) with up to 8 telephone circuits. Central concentrators are installed with their outwards connections strapped parallel. Increasing the number of central site concentrators thus increases the number of connections into the network from the central site without changing the number of telephone circuits connecting remote and central concentrators. All concentrators will be programmed as 8x128 configuration. Smaller (e.g. 8x32, 8x64) concentrators may be used initially with the uninstalled connections programmed as "unconnected".

Following figures and discussion will assume two central site concentrators, since this is expected to give the optimum number of central connections into the network for the anticipated mix of subscribers (terminal connections/devices).

We expect to make the connections of the concentrators, terminal devices, and the minicomputer as in figure 1. Some of the practices and protocols having to do with the layout and overall philosophy of the system can be set down at this time. They are discussed here in order from the outside world inwards towards the computer.

1. Management of unsolicited input from terminals.

We know of two types of unsolicited inputs; telephone ring signals and terminal microprocessor break signals. Telephone ring characteristics are defined, and ring-detect sensor cards will be installed in the ELD128s as needed, depending on which circuits are dedicated to telephone service. We expect to manage these by periodically (~0.25 second period) executing a program in each ELD128 microprocessor which interrogates the ring-detect sensor for each of the telephone circuits. The ELD128 microprocessor will then know of any ringing telephone circuits.

In the same execution period with the ring-detect poll, the ELD128 microprocessor must inspect each terminal microprocessor data circuit for a break signal by interrogating the loop-detect sensor attached to the circuit. Loop-detect cards are expected to be installed as required to permit sensing of each data circuit. We require that these data circuits be kept available for minicomputer-initiated outwards communications to the terminal microprocessor, and also that the terminal microprocessor be able to signal the ELD128 microprocessor. We expect to meet both these goals by allowing the terminal microprocessor to make its break signal by opening the circuit momentarily (that is, long enough to ensure detection in a loop-detect period). This will produce a (NOT loop-detect). The normal condition of the data circuit will be (loop-detect) sensed by the loop-detect card, because the terminal microprocessor's modem looks to it like a short circuit.

Loop-detect and ring-detect are indistinguishable to the ELD128 microprocessor. The sensor output signal will therefore be inverted on the loop-detect circuit boards. It will thus not be necessary to "teach" the ELD128 microprocessor which of its connections are telephone and which are data circuits. Inverting loop-detect sense will make the "alert" condition the same for data and voice, this is preferred for ease of programming.

2. Remote concentrator control circuit.

The control circuit for each remote concentrator will be assigned a telephone circuit with modems to its own central minicomputer multiplexor port.

3. Remote concentrator far connections.

Loop-detect and ring-detect circuit cards support connections in groups. Therefore, in the 128 possible terminal connections, we expect that the data circuits be in contiguous connections, separate from the voice connections.

4. Remote near connections and central far connections.

There are enough central concentrator far connections to allow a fanout of sixteen remote concentrators, using eight connections for each remote concentrator. Fewer connections (telephone circuits for subscriber digital or voice signals) may be utilized for traffic volumes below the design maximum.

5. Central concentrator control circuit.

Because the central concentrators are close to the minicomputer, the control information for each is passed through a direct connection to the minicomputer multiplexor.

6. Central concentrator subscriber voice (near) connections.

Telephone subscribers will be connected to and disconnected from the plant voice network by the concentrators under minicomputer control. The telephone plant can use all central site concentrator near connections which aren't used for data.

7. Central site concentrator near data connections.

Initially, one data circuit from each of the central site concentrators will be reserved for subscriber digital data by tasks in the minicomputer which are independent of the MSSS, except that they use MSSS to cause the data circuit to be switched to the proper terminal device.

The data circuits from network are each connected to the minicomputer multiplexor through modems.

## Software Overview

The Multiple-Service Switching System central minicomputer software comprises three principal elements: a switch-control task, a switching orders queue, and a subroutine which applications programs can use to put switching orders into the queue and to request service by the switch-control task.

Each of the concentrators contains a program which receives and executes switching commands from the central minicomputer. The remote concentrator programs also periodically inspect ring- and loop-detect sensors to determine whether any alert conditions have arisen in its subscribers, maintains a list of alert respondents, replies to central minicomputer alert polling, and executes hardware-assisted circuit verification procedures.

An applications program which needs a circuit established uses the switching-order subroutine to construct a switching order. The switching order indicates the two terminals of the circuit, namely it identifies which far connection of which remote is to be connected to which near connection of which central site concentrator. Trunk connections may not be specified by the applications program. The switching-order subroutine then places the switching order into the switching orders queue and messages the switch module of the switch control task. The subroutine suspends execution of the program which called it at this point, until the switch action has been successfully or unsuccessfully completed. A return-code set by the switch module will allow the applications program to take appropriate action if a failure occurs (e.g., re-try, wait and re-try, issue message,...)

The switch-control task is resident in the central minicomputer. Upon message receipt the switching module of the switch-control task will inspect the switching orders queue and attempt to execute any orders in it, in order of receipt in the queue. The module will audit the order to ensure that it makes sense in light of the system configuration, ensure that the connections requested are not busy, and then command the concentrators to make the connections needed to connect the specified terminals. The requesting program will be notified of the finished attempt and the status (done, or not-done and why).

The alert-polling module of the switch-control task periodically (~2 sec) communicates with each remote concentrator in the system to see if it has sensed any loop-break signals or ring signals in its polling. Any positive responses are routed to a dispatcher module of the switch-control task for application-dependent action.

The various modules of the switching-control task cooperate in the maintenence of pointers and tables which keep track of the status of connections, circuits, and devices. Also, a disc file created by an interactive program is read when the switching-control task is initiated. This file shows the network layout and allows the MSSS net to be modified without reprogramming.

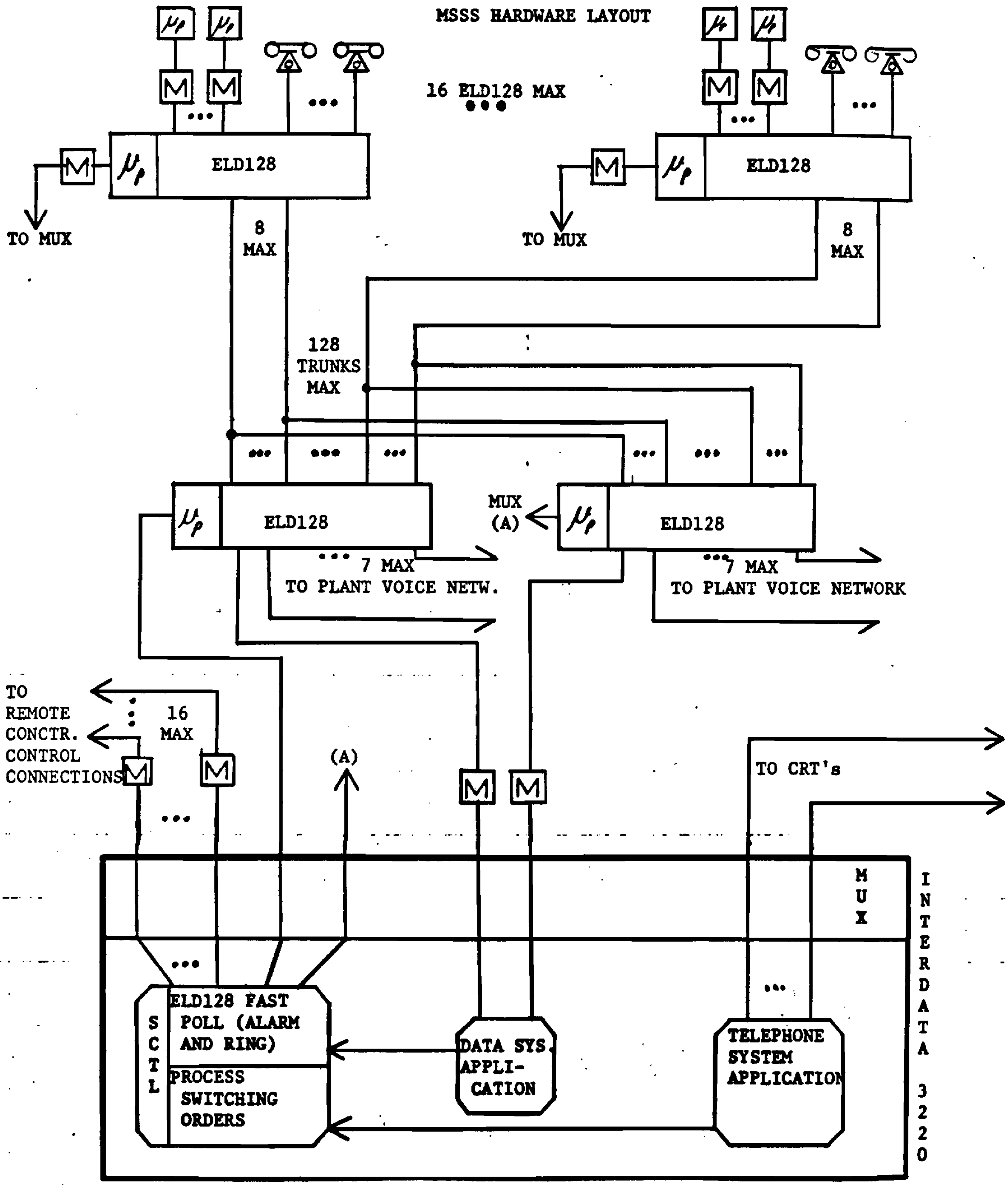
MSSS HARDWARE LAYOUT
16 ELD128 MAX
ELD128
ELD128
TO MUX
TO MUX
8 MAX
8 MAX
128 TRUNKS MAX
ELD128
MUX (A)
ELD128
7 MAX
TO PLANT VOICE NETW.
7 MAX
TO PLANT VOICE NETWORK
TO REMOTE CONCTR. CONTROL CONNECTIONS
16 MAX
(A)
TO CRT's
MUX
INTERDATA 3220
SCTL
ELD128 FAST POLL (ALARM AND RING)
PROCESS SWITCHING ORDERS
DATA SYS. APPLI- CATION
TELEPHONE SYSTEM APPLICATION

**FIGURE 1**

# MULTI-SERVICE SWITCHING SYSTEM FOR MEGAPLEX NETWORKS, INC.

Monthly Status Report
April, 1980

EES/GIT Project A-2559

Prepared by

Computer Science and Technology Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

W. A. Baird

for

Megaplex Networks, Inc.
5188 Roswell Road, N. E.
Atlanta, GA 30342

April

The interactive configurator which constructs the disc-resident network database has been written, tested, and demonstrated to the sponsor. The Interdata-resident switching task stubs for inter-task communications, I/O, and error logging were expanded, and the switching task error log protocol and disc record layouts were defined.

An interactive test (subroutine) version of the switching task was generated and exercised, debugging the database search and maintenance logic and the switching orders to the concentrators.

The code for the ELD 128 microprocessors has been written; we are now waiting for the RCA 1802 micromonitor and the 4K RAM card. These will let us test the microprocessor programs.

May

Work is underway on the smaller program which is used by the Interdata-resident switching task to load the database from disk to memory, where it is actually used. The initial version of MSSS will probably not support reloading the database "on-the-fly", instead, the MSSS will have to be halted and restarted by the operator to make it use a database reflecting network configuration modifications.

The console task to empty and reset the switching-task error log will be coded. A facility will be incorporated into the switching task to support communications with console tasks. This will permit synchronization with error-log dumping and will provide the "hooks" for such enhancements as orderly MSSS shutdown per operator request and database reload on-the-fly.

The timing and synchronizing code in the alert polling task is being completed.

Testing of the MSSS in the Interdata 8/32 with an ELD128 may begin in late May.

EXPENDITURES

A report of April expenditures will be made in mid-May.

MULTI-SERVICE SWITCHING SYSTEM
FOR MEGAPLEX NETWORKS, INC.

Monthly Status Report
May, 1980

EES/GIT Project A-2559

Prepared by

Computer Science and Technology Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

W. A. Baird

for

Megaplex Networks, Inc.
5188 Roswell Road, N. E.
Atlanta, GA 30342

May

The alert polling task coding has been completed, the activation timing and error-handling stubs have been filled in.

The switching-task configuration subroutine which loads the run-time database from disk has been coded and tested.

The Switching task has been enhanced to permit communication and synchronization with console tasks. This will support synchronized error-log copy and reset (file clearing) and will provide the hooks for later inclusion of orderly shutdown and database reload on-the-fly.

The switching task error-log dump-and-reset console task has been coded and tested.

The switching-task main program, its subroutines, and the subroutines which will be used by client tasks to communicate and synchronize with the switching task have been coded and documented with detailed program narratives.

Documentation for the ALERT task and the configurer task and the configurer subroutine has begun.

Documentation for the concentrator programs was completed.

Utilities have been written to load object files into the concentrator microprocessors from the DEC VAX.

June

Program narrative documentation will be completed.

We expect to begin testing the Concentrator-resident code early in June by connecting the ELD96 to the Interdata 8/32. The ELD96 must be used initially because of delays in receipt of the ELD128. Some temporary modifications will have to be made to the programs in order to make these tests, but we should still make net progress by not waiting for the right concentrators.

Testing of the integrated system, including the MSSS 8/32-resident code for switching orders, should be started near the very end of June.

EXPENDITURES

A report of May expenditures will be made in mid-June.

# Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

15 May 1980

Mr. John Stewart
Megaplex Network, Inc.
5188 Roswell Rd. N.E.
Atlanta, GA 30342

REFERENCE: Monthly Status Report

Dear John,

Per your request, included herein is the budget breakdown for the Multiple Service-Switching System project to supplement our Monthly Status Report for May.

| | MONTH | FISCAL YEAR | TOTAL CONTRACT |
|---|---|---|---|
| PERSONAL SERVICES | | | |
| Budget | | | 28,411.00 |
| Expended | 5,569.24 | 19,951.44 | 19,951.44 |
| Free Balance | | | 8,459.56 |
| RETIREMENT | | | |
| Budget | | | 2,803.00 |
| Expended | 585.32 | 2,088.67 | 2,088.67 |
| Encumbered | .00 | .00 | .00 |
| Free Balance | | | 714.33 |
| MATERIALS AND SUPPLIES | | | |
| Budget | | | 2,185.00 |
| Expended | 23.18 | 43.66 | 43.66 |
| Encumbered | .00 | .00 | .00 |
| Free Balance | | | 2,141.34 |
| CAPITAL OUTLAY | | | |
| Budget | | | .00 |
| Expended | .00 | .00 | .00 |
| Encumbered | .00 | 2,282.16 | 2,282.16 |
| Free Balance | | | -2,282.16 |

| | | | |
|---|---|---|---|
| TOTAL DIRECT CHARGES | | | |
| Budget | | | 33,399.00 |
| Expended | 6,177.44 | 22,083.77 | 22,083.77 |
| Encumbered | .00 | 2,282.16 | 2,282.16 |
| Free Balance | | | 9,033.07 |
| OVERHEAD | | | |
| Budget | | | 21,592.00 |
| Expended | 4,232.62 | 15,163.10 | 15,163.10 |
| Free Balance | | | 6,428.90 |
| TOTAL | | | |
| Budget | | | 54,991.00 |
| Expended | 10,410.36 | 37,246.87 | 37,246.87 |
| Encumbered | .00 | 2,282.16 | 2,282.16 |
| Free Balance | | | 15,461.97 |

Yours truly,

W. A. Baird
Project Director

A-2559

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# FOR MEGAPLEX NETWORKS, INC.

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Georgia Institute of Technology
Atlanta, Georgia 30332

W. A. Baird


for

Megaplex Networks, Inc.
5188 Roswell Road, N. E.
Atlanta, GA 30342

## June

June effort was less than usual because we took our vacations last month.

The test rig for the ELD was put together, and John Doss has been working at loading code into the switch microprocessor.

The initial versions of all the programs, for the Interdata and the switch microprocessor, have been written and documented.

A network configuration has been devised which will permit testing of concentrator and Interdata resident code together while requiring only one concentrator to be connected to the minicomputer.

## July

We expect to get an ELD128 the first week of July. Then we will test the microprocessor and the minicomputer code. As soon as testing/debugging is done we can generate the first production program set.

EXPENDITURES

A report of June expenditures will be made in mid-July.

A-2559

MULTI-SERVICE SWITCHING SYSTEM
FOR MEGAPLEX NETWORKS, INC.

Monthly Status Report
July, 1980

EES/GIT Project A-2559

Prepared by

Computer Science and Technology Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

W. A. Baird

for

Megaplex Networks, Inc.
5188 Roswell Road, N. E.
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## July

Two new ELD128 concentrators arrived. In one concentrator, two of the external flag lines and the interrupt line were locked high. These problems were overcome for testing by switching processor boards with the other ELD. The other ELD has power supply troubles. Parts-swapping thus produced one complete functioning unit. As soon as minor modifications are completed on it we will start using it to test the software.

The Interdata Run Time Library FORTRAN support routines for intertask control and communications cannot be used after all. The control services (HOLD and RELSE) do not function properly in our type of multitasking control discipline, and the communications routines aren't compatible with the interval-timer and custom-I/O subprograms we're using from the DEMS system.

The MSSS switching task and the SWITCH subroutine used by client tasks have been rewritten to use only DEMS-type command and control. The modified programs as set up for bench testing in a one-concentrator simulated network environment do work well, no intertask lockups have happened. This means that the MSSS switching software can be tested now.

August

The ELD128s will be modified to provide an interrupt to the processor on receipt of a character from the UART. This involves the modification of the processor board, the communications board, and the backplane. The ring detect board of the ELD128 will also be modified to function identically with the loop detect cards. This will allow mixing of ring detect and loop detect cards without modifying the software.

We will then be able to test the concentrator and the Interdata programs with each other. After the bugs are shaken out of the programs in this environment we will reflect the corrections into the parent programs and can then test the system in a multi-concentrator real-life working environment.

After multi-concentrator testing, only cleaning up of the documentation will be required to finish the MSSS project. This means that only another one or two manmonths should have to be spent.

EXPENDITURES

A report of July expenditures will be made in mid-August.

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

22 August 1980

Mr. John Stewart
Megaplex Networks, Inc.
5188 Roswell Rd. N.E.
Atlanta, GA 30342

REFERENCE: Monthly Status Report for July 1980

Dear John,

As you requested, here is a budget breakdown for the Multiple Service Switching System project to supplement our Monthly Status Report for July.

| | MONTH | FISCAL YEAR | TOTAL CONTRACT |
|---|---|---|---|
| PERSONAL SERVICES | | | |
| Budget | | | 28,411.00 |
| Expended | 1,521.54 | 1,521.54 | 28,307.35 |
| Free Balance | | | 103.65 |
| RETIREMENT | | | |
| Budget | | | 2,803.00 |
| Expended | 169.04 | 169.04 | 2,976.00 |
| Encumbered | .00 | .00 | .00 |
| Free Balance | | | -173.00 |
| MATERIALS AND SUPPLIES | | | |
| Budget | | | 2,185.00 |
| Expended | 6.54 | 6.54 | 257.12 |
| Encumbered | 171.68 | 171.68 | 171.68 |
| Free Balance | | | 1,756.20 |
| CAPITAL OUTLAY | | | |
| Budget | | | .00 |
| Expended | .00 | .00 | 2,274.15 |
| Encumbered | .00 | .00 | .00 |
| Free Balance | | | -2,274.15 |

| | | | |
|---|---|---|---|
| TOTAL DIRECT CHARGES | | | |
| Budget | | | 33,399.00 |
| Expended | 1,697.12 | 1,697.12 | 33,814.62 |
| Encumbered | 171.68 | 171.68 | 171.68 |
| Free Balance | | | -587.30 |
| OVERHEAD | | | |
| Budget | | | 21,592.00 |
| Expended | 1,110.72 | 1,110.72 | 21,467.94 |
| Free Balance | | | 124.06 |
| TOTAL | | | |
| Budget | | | 54,991.00 |
| Expended | 2,807.84 | 2,807.84 | 55,282.56 |
| Encumbered | 171.68 | 171.68 | 171.68 |
| Free Balance | | | -463.24 |

So, you see that we have gone slightly over our budget, as I indicated to you was to be expected to happen this month. As you asked, the monthly report from the eleventh of August did show just where MSSS stands, and what we expect to do to finish up. The testing, incidentally, is now under way and the concentrator and Interdata 8/32 are communicating. The concentrator is switching connections per MSSS orders over an ITAM line. Although it's hard to guess what bugs may surface, I should imagine that at most a month of John Doss' time, a third of a month of Connie Foulke's, and a month and a half of mine will finish up. That would amount to about $6,000 in personal services, or about $10,500 in total charges excluding duplication services and such.

I believe that I had better not proceed with this work on MSSS until you communicate to my Office of Contracts Administration that you're willing to keep footing the bills despite our being past our original estimates.

Yours truly,

W. A. Baird
MSSS Project Director